with an orthorhombic or a monoclinic symmetry. Those of the latter kind are triangular in shape and are supposed to owe their abnormal symmetry to twinning.—Mr. Cross[1] has noticed striations in the cubic faces of *galena* from the Minnie Moore mine, Bellevue, Idaho, which he believes to be due to twinning lamellæ produced by the slipping of alternate bands of the mineral along gliding planes, as a consequence of pressure. The twinning planes lie in the zone between ∞O ∞ and ∞O—New methods for the detection of tin, caesium, and rubidium under the microscope are suggested by Streng[2] The detection of tin depends upon the fact that KCe and Sn Ce yield a double salt, which crystallizes in little tabular orthorhombic crystals, which upon the addition of nitric acid pass over into octahedroas modified by icositetrahedrons. Caesium and rubidium chlorides with stannous chloride in hyrochloride acid solutions give crystals of the same shape as those of potassium and stannous chlorides, but in the case of caessium these are brightly polarizing, while in the case of rubidium they are monoclinic. The author also calls attention to the fact that all hydrofluoric acid sold as pure, even when carefully made from cryolite, contains silica and cannot be used for the detection of this substance in small quantities.—Calcium carbonate readily decomposes solutions of aluminium salts in the cold, with precipitation of gelatinous aluminium hydroxide, which, in the presence of coloring matters absorbs these and becomes stained, Under the same conditions dolomite produces no change in the solutions unless it remains in contact with them for a long time. A knowledge of these facts induces Lemberg[3] to propose a method of distinguishing between calcite and dolomite in thin sections of rocks. The solution which he proposes for use is made by dissolving four parts of dry aluminium chloride in sixty parts of water and adding to it six parts of *haematoxylin campechianum*,

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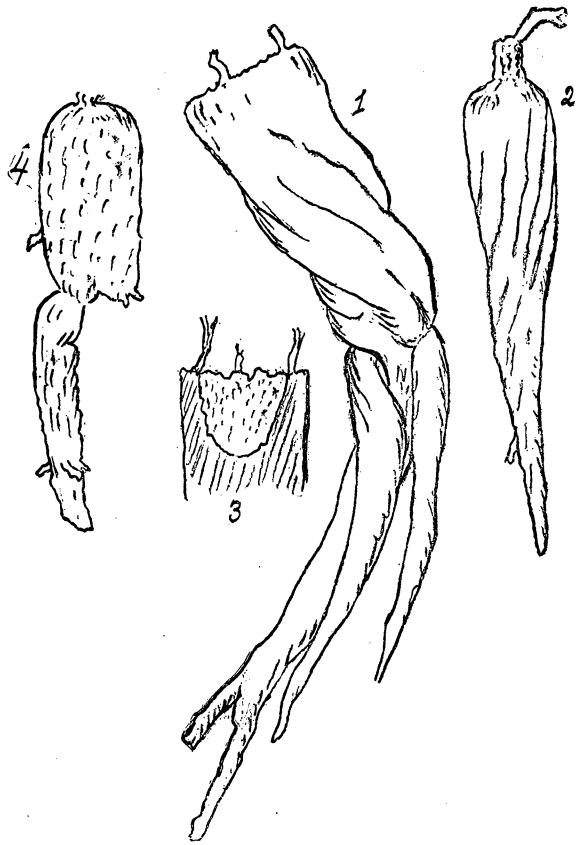
## BOTANY.[4]

TWO BIG-ROOTED PLANTS OF THE PLAINS.—Now and then some of the plants of the plains present odd characteristics not observed in some of the eastern regions. Two species native of the open plains at an altitude of from 2,000 feet above the sea to the base of the Rocky Mountains are remarkable for their enormous roots. One

1 Proc. Col. Scient. Soc. 1887, p. 171.
2 Neues Jahrb. f. Min., etc., 1888, II., p. 142.
3 Zeits. d. deuts. geol. Gesell. XL., 1888, p. 357.
4 Edited by Chas. E. Bessey, Lincoln, Nebraska.

of these is the Wild Pumpkin (*Cucurbitale perennis* Gray), which produces a trailing stem, bearing triangular, woolly pubescent leaves, whose blades are six to eight inches in length. The fruits are about the size of an orange, and are perfectly spherical in shape. When ripe they are yellow with some greenish longitudinal markings. Internally they are exceedingly fibrous, and contain a great number of seeds (about 200) which are about one-third of an inch in length




But the root is the remarkable part of the plant. Two specimens were brought to my laboratory last fall, figures of which are given herewith. The largest (Fig. 1) measured when first dug nearly seven feet in length, and at the top or crown had a diameter of fully eleven inches. The crown is curiously hollowed out, as shown in Fig. 3, the cavity being fully six inches in depth. The inside of the cavity

is covered with a healthy cortex, and there is no sign of decay about it. Around the margin of the cavity are the remains of several stems, showing that in this portion the buds for the annual running stems occur. At about two feet from the crown the root bends abruptly and sends out a couple of branches. When in the ground the part below the bend was vertical, while that above was inclined. The root grew upon a hillside and its upper portion was nearly if not quite perpendicular to the surface of the ground. The bend was probably occasioned by the slow sliding of the upper strata of the soil down the hill. The branches are much smaller where they emerge from the main root, and enlarge considerably within the first six or eight inches.

The smaller root (Fig. 2) measured when taken from the ground nearly four feet in length, and had a diameter of about eight inches. It is regular in form, and is not much branched. Its crown is extended into a neck five or six inches long, and upon the upper part of this are the remains of the branching stems.

Both roots are very fibrous internally, almost woody in fact, but they contain also an enormous amount of stored up nourishment for the rapid development of the annual stems. The first (1) weighed eighty pounds when fresh, and the second (2) thirty-three. But this store of nourishment is amply protected against the hungry gophers, moles, mice, rabbits, squirrels and larger animals, for it is intensely bitter. In the struggle for existence those only have remained whose bitterness was sufficient to overcome the hunger and thirst of the animals of the plains.

The second big-rooted plant is the Wild Morning Glory (*Ipomœa leptophylla* Torr), a beautiful plant of a bushy habit, bearing numerous large pink-purple flowers closely resembling those of the common cultivated Morning Glory of the gardens. The stems are numerous and branching, but not twining, and they rarely attain a height of more than a couple of feet.

The root is enormous, often approaching the size of that of the Wild Pumpkin. A specimen in my laboratory is shown in Fig. 4. It is nearly three feet in length, and evidently was originally much larger, and has a diameter of eight inches. As may be seen, it branches at about fifteen or sixteen inches from the top. On the one side there were originally several branches, but on the other but one. This shows, also, the peculiarity noticed above of the smaller size of the branch root at the point of its origin, and its subsequent enlargement.

Both of these plants come down upon the plains to about the 100th meridian. In northern Nebraska at Long Pine, I have seen the Wild Morning Glory ten or twelve miles east of that meridian. The wild pumpkins are abundant in Lincoln County (south of the Platte River), not more than fifteen or eighteen miles west of the line mentioned.—*Charles E. Bessey.*

HERBARIUM NOTES.—AN ALPHABETICAL ARRANGEMENT.—In arranging an herbarium one's first thought would be to arrange it according to some recognized natural system of which it would then constitute a practical application. Yet,as herbara are intended much more for use in the identification of species than for instruction in systematic botany or for embodiment of ephemeral classifications, alphabetical arrangements based on assumed convenience are probably the prevailing ones. These alphabetical arrangements may be either of species in a genus or of genera in certain large groups, as the Fungi, the composite or the Grasses; but they are all based on the idea of convenience of reference.

As to the alphabetical arrangement of genera. Without considering the question whether a natural arrangement, even if slightly less convenient, would not be preferable, I believe that such an arrangement can be shown to be equally convenient. In the first place the largest families of Fungi, for example, as the Icaceæ, Uredineæ, or Sphæriaceæ; are by no means as large as A, C, S, or P of an alphabetical arrangement. The larger groups like S and P are exceedingly inconvenient unless subdivided; and surely it is of more value to the student to know the subdivisions of the Sphæriaceæ than of S, unless he is preparing himself to be a Register of Deeds. The convenience of an alphabetical arrangement arises from the familiarity of the alphabet, yet the names of the natural sub-divisions of plants should be scarccly less familiar to the botanist. Then, too, allied genera are often wanted at the same time; genera of the same initial letter probably never. Plants are generally studied in small groups; and nothing could be more inconvenient to the student of a tribe than to find six genera in six distinct groups, each of which must be carefully searched, nor more convenient than to have them together, perhaps even placed in the very order in which he wishes to study them.

Somewhat more can be said in favor of an alphabetical arrangement of species in a genus. Such an arrangement is not needed to any appreciable extent, however, except in very large genera. Yet in such genera as Carex, for example, a natural arrangement is equally convenient, without regarding the fact that it is infinitely more instructive. Almost any one who has spent much time in the matter can put a Carex into the proper group, the species within the group is the difficulty; and it is much more convenient to have all the species of a group together than to be forced to search through five or six letters. But in genera of Fungi, as Cercospora, where there is no very good natural arrangement, it might be said, is better than one based on the host, such as is usually given in the books, because neither is particularly instructive and the first is the handier. Yet, as herbarium specimens are consulted for the most part in connection with a manual, an arrangement following it would certainly be perfectly convenient. And, perhaps, it would not trouble the student over much to remember that Cercospora viticola is on the

grape and therefore, goes in the section "in Di cotyledonis lignosis," while he could gain very little from the reflection that its specific name begins with "J."

THE ALGÆ FUNGI AND LICHENS.—Many who no longer hold the idea of the autonomy of the groups Fungi, Algæ, and Lichens, nevertheless persist in keeping them separate in the herbarium. This, too, is done on the plea of convenience, as they are usually studied by different students. Letting alone the question of whether it would not be better for the mycologist to think more about Algæ, I believe that an herbarium where all plants are arranged according to a natural system without regard to anything else is perfectly convenient for reference, as long as the families are clearly indicated on the cases. If this is so, the natural arrangement is clearly preferable. For these are not mere questions of convenience. In the case of a classification, if mere convenience of placing specimens in their proper genera and species were all that was to be considered, perhaps no system would be superior to the celebrated one of Linnæus But this is one of the last things which we demand of a classification. The function of a classification is to teach us the relations, the ancestry and thus a part, it may be, of the history of plants. So with an herbarium. Its object should be no more to furnish authentic specimens for the determination of single species than the higher one of teaching us the relations of these species by bringing together their names.—*Roscoe Pound.*

SACCARDO'S GREAT WORK ON FUNGI.—Although Saccardo's Sylloge Fungorum has been noticed in the NATURALIST from time to time upon the appearance of the volumes, it may be of service to our readers to indicate more fully the scope of the great work. The intention of the author (Professor P. A. Saccardo of the University of Padua) is to publish in one work the descriptions of all the Fungi now known in all parts of the world. Such an undertaking involves as all will admit, an immense amount of labor, and he must have been a bold man indeed who willingly entered upon it. As a matter of course such a work, intended for the whole world, could be written in Latin only.

The first volume appeared in 1882, the second in 1883, the third in 1884, the fourth in 1886. In the latter year A. N. Berlese and P. Volgins brought out a supplementary volume to volumes I to IV, in which additions and corrections were made. The fifth volume appeared in 1887, and the sixth and seventh in 1888. The eighth and concluding volume may be looked for some time during the present year. The total number of pages thus far printed is 6898, and doubtless the final volume will bring the number up to 7700.

The system adopted by Saccardo may be learned from the following synopsis:

ORDER PYRENOMYCETEÆ Fr. Em. De Nat.
Family 1. *Perisporiceæ* Fr.
" 2. *Sphaeriaceæ* Fr.
" 3. *Hypocreaceæ* De Nat.
" 4. *Dothideaceæ* Nits. et Fkl.
" 5. *Microthyriaceæ* Sacc.
" 6. *Lophiostomaceæ* Sacc.
" 7. *Hysteriaceæ* Corda.

ORDER SPHŒROPSIDEÆ Lev. reform.
Family 1. *Sphæroideæ* Sacc.
" 2. *Nectroideæ* Sacc.
" 3. *Leptostromaceæ* Sacc.
" 4. *Excipulaceæ* Sacc.

ORDER MELANCONIEÆ Berk.

Including six "Sections" which are designated Hyalosporeæ, Scaloce-allantosporeæ, Phæosporæ, Didymosporeæ, Phragmosporeæ

ORDER HYPHOMYCETEÆ Martins.
Family 1. *Mucedineæ* Link emend.
" 2. *Dematieæ* Fr.
" 3. *Stilbeæ* Fr.
" 4. *Tuberculariecæ* Ehrenb. emend.

ORDER HYMENOMYCETEÆ Fr.
Family 1. *Agaricineæ* Fr.
" 2. *Polyporeæ* Fr.
" 3. *Hydneæ* Fr.
" 4. *Theleporeæ* Pers.
" 5. *Clavarieæ* Corda.
" 6. *Tremellineæ* Fr.

ORDER GASTEROMYCETEÆ Wild.
Family 1. *Phalloideæ* Fr.
" 2. *Nidulariecece* Fr.
" 3. *Lycoperdaceæ* Ehreub.
" 4. *Hymenogastraceæ* Vttt.

ORDER PHYCOMYCETEÆ DeBary.
Family 1. *Mucoraceæ* DeBary.
" 2. *Peronosporaceæ* DeBary.
" 3. *Saprolegniaceæ* DeBary.
" 4. *Entomophthoraceæ* Fowakow.
" 5. *Chytridiaceæ* D. By eb. Worou.
" 6. *Protomycetaceæ* DeBary.

COHORT MYXOMYCETEÆ Wallr.

Subcohort I. **Myxomyceteae** (Grauinæ)

ORDER PROTODERMIALLŒ Rost.
Family 1. *Protodermiaceæ* Rost.

ORDER CALCAREÆ Rost.
Family 1. *Cienkowskiaceæ* Rost.
" 2. *Physaioceæ* Rost.
" 3. *Didymiaceæ* Rost.
" 4. *Spumariaceæ* Rost.

ORDER AMAUROCHETEÆ Rost.
Family 1. *Echinosteliaceæ* Rost.
" 2. *Stemonitaceæ* Bel.
" 3. *Raciborskiaceæ* Bel.

" 4. *Amaurochaetaceæ* Rost.
" 5. *Brefeldiaceæ* Rost.
" 6. *Enerthenemaceæ* Rost.
ORDER ANEMEÆ Rost.
Family 1. *Liceaceæ* Rost.
" 2. *Clathroptychiaceæ* Rost.
ORDER HETERODERMEÆ Rost.
Family 1. *Cribrariaceæ* Rost.
ORDER COLUMELLIFERÆ Rost.
Family 1. *Riticalariaceæ* Rost.
ORDER CALONEMEÆ Rost.
Family 1. *Perichaenaceæ* Rost.
" 2. *Arcpriaceæ* Rost.
" 3. *Trichiaciæ* Rost.
Appendix. ORDER SOROPHOREÆ Zoph.
Family 1. *Guttubineæ* Zoph.
" 2. *Dictyosteliaceæ* Rost.
Sub Cohort II. **Monadineae** Cienk.
ORDER MONADINEÆ AZOOSPOREÆ Zopf.
Family 1. *Vampyrelleæ* Zopf.
" 2. *Burrsullineæ* Zopf.
" 3. *Monocystaceæ* Zopf.
ORDER MONODINEÆ ZOOSPOREÆ Zopf.
Family 1. *Pseudosporeæ* Zopf.
" 2. *Gymnococcaceæ* Zopf.
" 3. *Plasmodiodiophordæ* Zopf.
ORDER USTILAGINEÆ Tul.

Artificially divided into "Amerosporeæ" "Didymosporeæ" and "Dictyosporeæ."

ORDER UREDINEÆ Brongn.

Artificially divided into "Amerosporeæ" "Didymosporeæ "and "Dictyosporeæ."

The final volume will contain the Discomyceteæ, Tuberaceæ and Satrigomyceteæ, and the whole work will then be one which every student of the Fungi will need to have. The descriptions, while often mere translations or copies of the originals, are in the case of the species of certain groups entirely re-written. The total cost of the whole work will be about one hundred dollars.—*Charles E. Bessey.*

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## ZOOLOGY.

TWO REMARKABLE RADIATES.—In the *Aarsberetning* of the Bergen Museum for 1887 (but recently issued), Dr. D. C. Danielssen describes two interesting forms obtained by the dredge in the recent Norse North Atlantic Expedition. When collected they were